Rapidly Increasing Sea-Ice Melt and Impact on Walrus Population

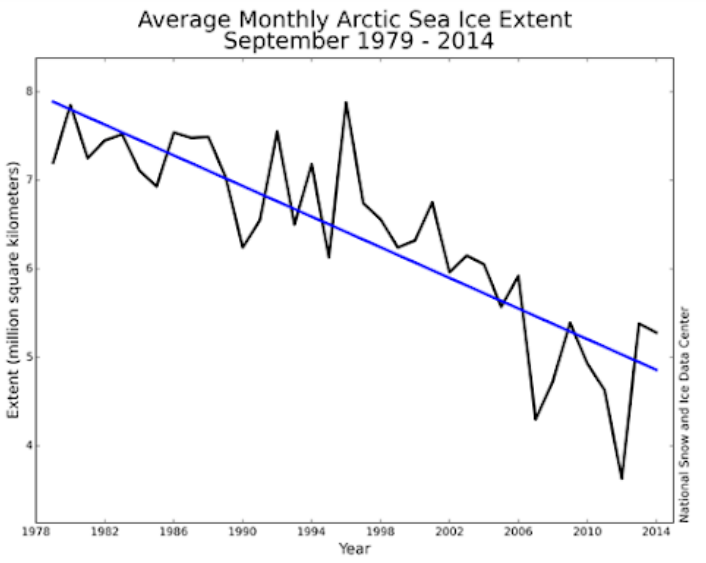
Climate change and the increasing rate of global ice melt is leading to a dramatic decrease in the population of walruses, due to sea-ice habitat loss.

Why is Sea Ice Melting?

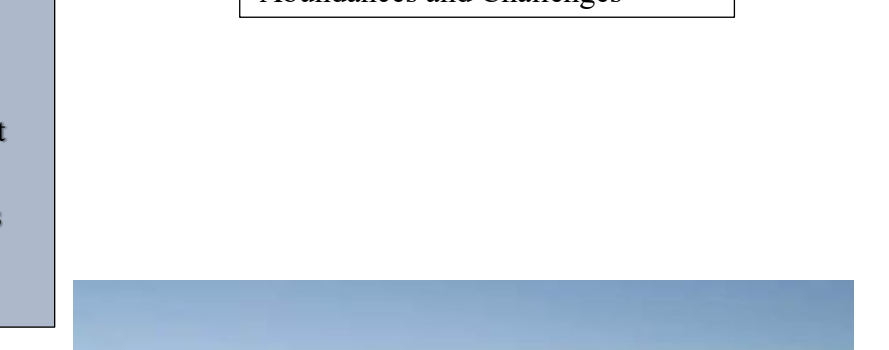
- An increase in CO_2 and other greenhouse gases have increased global temperatures that causes sea-ice to melt
- The high albedo of ice reflects far more sunlight than water does, so as more ice melts, more water is exposed which absorbs sunlight and increases water temperature, which melts more sea-ice, creating the positive ice-albedo feedback cycle.

How are Walruses Impacted?

- Pacific walruses live on shallow Artic continental shelves and feed on macroinvertebrates
- The walruses use sea-ice as a feeding and resting platform when they are foraging for food, so the lack of sea-ice inhibits the walrus population's ability to feed, leading to a decrease in population
- Less sea-ice also increases human-walrus interaction
- A smaller habitat for walruses causes the population to gather in large groups, creating an increase danger for deadly trampling events and diseases
- Walruses can dive up to depths no greater than 200 m, and cannot adapt to deeper waters as fast as the ice is melting



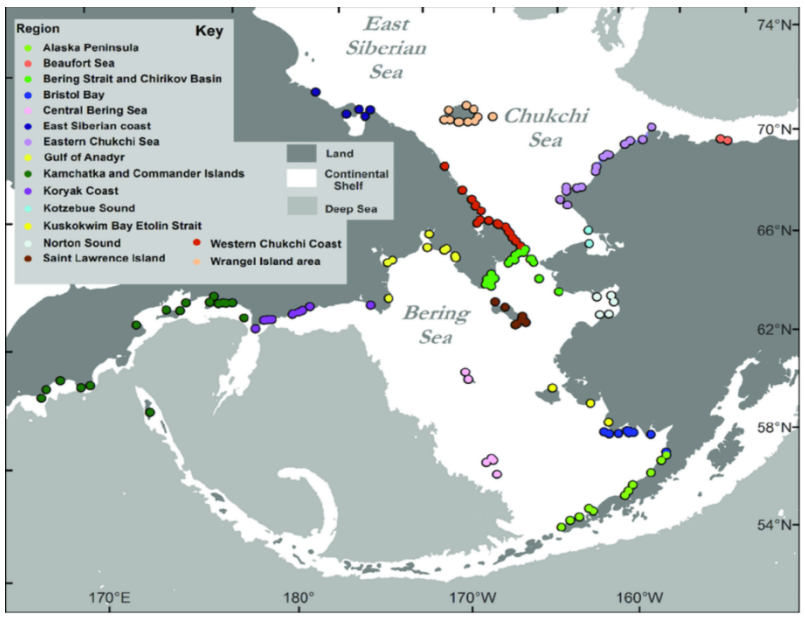
Average Monthly Arctic Sea Ice Extent 1979-2014



Walrus Distribution Map Showing Abundances and Challenges

Potential Solutions

- Global limits and fines on high or increasing pollution levels
  - Pollution contributes to the loss of habitat for the walrus population, and raising consequences will help enable growth of the species and prevent further sea ice from melting
- Ban hunting walruses
  - Walruses are hunted for their tusks, skin, and blubber. By implementing bans on hunting (excluding that of subsistence hunting and that by indigenous peoples), we can reduce walrus deaths by a significant amount
- Build fences around cliff areas
  - Building fences will help prevent the walruses from falling to their deaths during stampedes or simply because of their bad vision



Map showing Pacific walrus coastal haulout locations reported in the Pacific Walrus Coastal Haulout Database, 1852-2016.

Walrus Population targeted by Hunters for their Tusks

"Summers in the northernmost sea are likely to lose their ice cover entirely by 2035"

- *Nature Climate Change*

Potential Downsides of Protecting the Walrus Population:

- On the economic standpoint, it is potentially costly to build structures to protect the walrus habitats. An example of this would be building fences around cliff areas to decrease the likelihood of walruses falling to their deaths. This would be difficult to construct and to maintain.

Potential Benefits of Protecting the Walrus Population:

- If a hunting ban were to be enforced, this would reduce the deaths of walruses from hunting by 50%, allowing more walruses to survive and reproduce to replenish the population.
- If there were to be a global limit on the amount of pollution emitted to slow the rate of climate change with an enforced fine on those who surpass the limit, walrus habitats will be protected along with a slowed rate of sea ice depletion. This would benefit the walrus population and the planet by reducing the amount of pollution and damages caused by climate change.

Systems Approach

Socio-ecological

- a lack of effective global warming policies is a major player in increased ice melt
- regulating greenhouse gas emissions will lead to a decrease in the high temperatures that contribute to ice sheet melting

Eco-environmental

- a hunting ban, while protecting the walruses, could potentially impact organisms lower on the food chain with more walruses eating more prey (crustaceans, octopuses, clams) causing their numbers to dwindle
- implemented trade routes within walrus habitat could potentially disrupt their movements over the land, breeding, and hunting habits

Socio-economic

- Hunting ban will reduce walrus deaths, but if this ban includes subsistence and indigenous hunting it could harm people's way of life including:
  - difficulty selling ivory artwork from indigenous peoples
  - difficulties in finding sources of food

Why Should We Care?

- A decrease in sea ice means less natural area for walruses, and an increase in walrus-human interactions
- Wild animal populations can carry unknown disease, and an increase proximity to humans can have major health risks
- Smaller ice area causes female walruses and calves to gather on shorelines, which are usually occupied by males. Walruses will stampede when scared by predators and can easily crush the calves.
  - "In 2007, 3,000 to 4,000 walruses, mostly calves, were trampled to death along the Chukotka, Russia cost alone" (Endangered Species Coalition)
- The calves forced onshore by decreased ice face a significantly greater amount of threats from predators and humans
- As the walrus population decreases, it will become harder for indigenous communities that rely on walruses for subsistence hunting to survive
- Sea ice holds many ancient viruses, bacteria, and pathogens, and when melted they can be released to marine animals
  - "Researchers concluded that melting Arctic sea ice caused by human driven climate change paved the way for PDV to spread to new regions and infect populations marine mammals, especially along the northern Russian coast and Canada" (BBC News)

Focus on Alaska

- Alaska's temperature has been warming at a rate that is twice as fast as the global average since the middle of the 20th century
- Longer sea ice-free seasons, higher ground temperatures, and relative sea level rise will increase flooding and erosion in many regions which will lead to the loss of terrestrial habitat
- With changes happening this quickly, animal and human populations will have trouble adapting in time

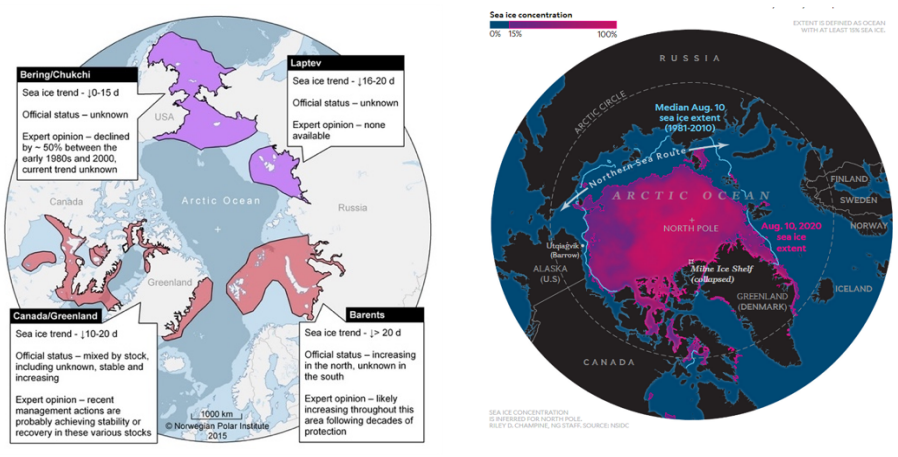


Diagram shows the regional decrease in ice and its relation to the status of walrus populations in the areas.